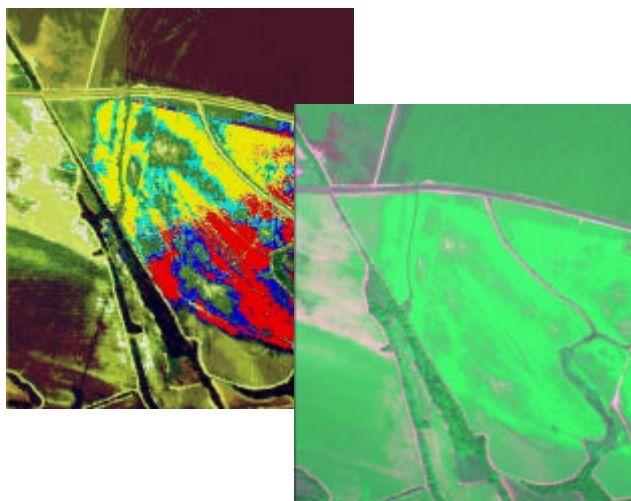


NASA Office of Technology Transfer

John C. Stennis Space Center

Practical Remote Sensing Application for Agriculture

NASA remote sensing technology provides farmers a valuable management tool



Airborne equipment provides information sets critical to application of seed, chemicals and water necessary for row crop farm management.

Aerial surveys of plant health in row crops are converted into crucial farm management information plots for each field. These plots are delivered overnight to subscribing farmers. After review, the plots are converted to machinery control discs and installed on farm equipment to manage the appropriate applications of seed, chemicals and water when and where needed. The process is repeated throughout the crop planting, growing and harvesting season. This entire operation has been installed and tested on four Mississippi Delta farms. Its use demonstrated operational **cost savings of more than fifty dollars per acre** and **increased cotton production by ten percent on average**.

Stennis Space Center's (SSC) Office of Technology Transfer (OTT) in partnership with SSC's Earth Science Application Directorate (ESAD) developed and implemented a program to improve the value and utility of commercial aerial remote sensing technologies for farmers; specifically their utility in row crop farm management. Plant science and practical farm utility issues were solved, and a system using remote sensing observations and data delivery was developed and demonstrated successfully on four pilot farm operations as well as the MSU Delta Region Experiment Center (DREC).

HOT Points

- "Farmer friendly," directly machine compatible, easy to learn and use, timely and accurate crop growth information.
- Demonstrated farm economic impact
Cost savings of \$50 per acre in cotton
10% average cotton yield increase
- Automated ground cover change highlighting.
- Useful for improvement of forestry, ecology and economic development management.

In January 2000, NASA's John C. Stennis Space Center awarded a competitive Small Business Innovation Research Contract to Global Positioning Solutions, Inc. of Inverness, MS, to develop and demonstrate an effective approach to use plant stress management and other related plant sciences to improve cotton farming—and possibly other row crop agricultural operations. A broad research and technology application project was defined and carried out in conjunction with Mississippi State University and U.S. Department of Agriculture scientists. The causes and manifestations of plant stress in row crop plants were investigated and detailed in both greenhouse and field studies.

A partnership was developed with DATASTAR of Picayune, Mississippi that added to the project the capabilities to accept, manipulate, geo-reference, store and deliver complex GIS-based remotely sensed plant stress information sets to users via the Internet. Aerial detection systems were developed and demonstrated; and information systems having outputs compatible with farmers' management approaches and their farm machinery controls were developed, implemented and tested satisfactorily on four mid Mississippi Delta cotton farms as well as at Mississippi State University's Delta Research and Experiment Center (DREC).

The overall objectives were achieved within two years. Based upon initial surveys of bare fields for soils characterization, and periodic aerial monitoring of crop development, the following capabilities and impacts were successfully demonstrated:

- Timely, comprehensible, information- rich crop development field plots were acquired delivered and presented in a farmer-usable format.
- Machinery-compatible seed, chemical and water application control discs were then cut from the management information sets.
- Harvest estimates made in early June were demonstrated to be accurate within \pm ten percent.
- Reduction of crop production cost by \$ 50 - \$70 per acre was achieved.
- Crop yield increase from an average of 810 pounds of lint per acre to about 880 pounds per acre was achieved.
- A business method patent on the process is being pursued by one of the program partners.

All four of the initial farmers who participated in the remote sensing information utility project are well known as progressive and innovative farm operators. They represent the epitome of “early adopters” of new technologies and new farming techniques. But they are also experienced skeptics of endorsing underdeveloped or over advertised “new” approaches to farming. However, in this instance all of them employed and endorsed the Remote Sensing augmentation approach to crop development, yield prediction and harvesting. They recognized and applauded the production cost savings and improved crop yields that were gained in the their 200-acre test plots. A major output of the aerial survey and monitoring program before and during the growing season was the remote sensing system's ability to detect and identify the various soil plots and plant stress locations in each area. These plots made specific prescriptive treatments possible and effective for individual plots as small as twenty- five acres.

The second major achievement was the demonstration of DATASTAR's capability to accept aerial imagery from the web on the date the data were taken, to process the data on a pixel-by-pixel basis, to geo-reference the entire plots, to detect pixel level changes in both growth and stress, and to provide the total information set to the service-subscribing grower in time for him to effect the corrective action needed to ameliorate problems or exploit early harvest potential. It was also shown that accelerating harvesting by a month saved at least fifty dollars per acre in crop production costs.

The system issue now being addressed is user support service enhancement. Supplying these services includes educating and training advanced agricultural specialists who can assist farmers in setting up and using the remote sensing based techniques and to enable service expansion to a broader community of row crop growers. These new specialists are in training at the Mississippi Delta Community College, and the vanguard group will enter the agricultural work force in the upcoming growing season. They can assist farmers in applying the new techniques, and they will facilitate implementation of the systems and tools that are needed to make the new approach profitable to the next level of adopters in the farming community.

Points of Contact

• **Global Positioning Systems, Inc.**
Inverness, Ms.
PH – 662 455-4300
E-Mail – gpsinc@techinfo.com

• **NASA Office of Technology Transfer**
Stennis Space Center, MS
PH – 228-688-1929
Web – technology.ssc.nasa.gov
E-Mail – technology@ssc.nasa.gov